Appropriate Use of Technology

Fred Gilbert was always "steeped in the old but espousing the new." The accelerating technology revolution greatly interested but also concerned him. While technological advances were conceded to be important, he was always troubled about their appropriate use. The following article reviews his hopes and misgivings. In it he makes the bold suggestion that a percentage of income from equipment should be set aside for research on outcome effectiveness.

The Appropriate Use of Technology (Particularly in Medical Problems of the Elderly)

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Reprinted from the *Hawaii Med J.* 1990;49:340-345.

Technology, particularly high technology, with little solid data, is often blamed for much of our increasing cost of health care. Politics and emotions are poor substitutes for accurate information needed for rational solutions. By targeting the desired outcome and studying the process needed to reach the outcome, we can make better decisions. The methods of designing, conducting and funding the studies needed to answer the difficult questions posed by the use of high technology in the elderly are available. Do we have the wisdom to use them?

Introduction

Technology is enormously useful in most fields of medicine but is frequently used for the wrong problem, on the wrong patients, and at the wrong time. I will discuss those issues that contribute to the improper use of technology and the means of resolving them.

I direct my concerns regarding the appropriate use of technology to the elderly, because there are so many of them and because they are the recipients of most of the misuse of technology. (Webster, incidently, defines elderly as "somewhat old, between middle and old age.")

My observations are drawn from 25 years of experience as a practicing general internist, followed by 15 years as a specialist in the field of nuclear medicine. As a general internist, the technology that I used most frequently and continue to use is that wonderful creation called the ballpoint pen; it is followed in importance by the telephone, and at considerable distance by the stethoscope, reflex hammer and EKG machine. The field of nuclear medicine, on the other hand, requires the creation of images from gamma rays detected by very expensive cameras that count data reconstructed by complex computer manipulations.

Technology

What is the magnitude of unwise use of technology? From the standpoint of costs, the Office of Technology Assessment found almost one-third of increased spending for Medicare was due to medical technology.[1] The 11% of the population over 65 consumes 50% of the federal health budget, and slightly less than that in terms of physicians' time. There is no question in my mind as to whether patients can be better served with the new technologies than previously. The answer is yes, they can be. Virtually all of what we call high technology in medicine has emerged since I started to practice in 1946. If that high technology didn't exist, we didn't have to worry about it.

In short, if a physician completed medical school and residency in the late 40s and attempted to practice today without access to the technological advances of the last 40 years, he would find considerable difficulty in dealing with most clinical problems of any magnitude. I have a strong feeling, however, that his patients of yesteryear were more satisfied with his efforts, if not his results, than they are now.

Certainly many, if not most, of the new procedures present the patient with less risk to life and limb and with often measurably better outcomes than those of the past. As an outpatient procedure, we can slip a marvelously designed piece of equipment called a pacemaker beneath the skin of the chest and with a wire attached to the heart, correct life-threatening disturbances of the heart rhythm. With new techniques for studying the brain, we have replaced uncomfortable, risky and costly procedures such as pneumoencephalograms and most cerebral angiograms.

To What Purpose?

I could go on with examples of the positive benefits versus risks, including risks to the pocketbook as well as to the person, by the new technologies. The problem, however, is not with the new technologies. The problems—and they are multiple in different arenas. These include questions such as who decides and under what circumstances is the technology to be used? Who pays for it? Who is to receive it? These questions in turn are shaped by another level of questions.

What is the cost of not using technology? In the past, a physician would examine a patient with a headache after taking a history and then make a decision as to whether or not to proceed with further tests, and usually decided not to. Now, although the physician knows that almost all CAT scans performed for headaches are a waste of time and money and often carry a risk to the patient's health, he also knows that a malpractice suit can result from the failure to carry out such a scan. He, therefore, orders it as additional malpractice insurance.

Patient and family expectations also play no small role in a physician ordering procedures for reasons other than medical indications.

It also should be noted that most physicians, particularly subspecialists, derive a sizable portion of their incomes from technological gadgets rather than from their knowledge, judgment, compassion and understanding. Every natural body orifice permits at least one instrument to be inserted by one or more

specialists. If an instrument with a light on one end cannot be inserted down the gullet or windpipe or up the rectum or through the urethra, or into the ear or nose any good "ologist" lacking a natural orifice can always make an unnatural one through which he or she can introduce a costly instrument. It is not that procedures such as gastroscopy, colonoscopy, and bronchoscopy, with the ability to biopsy suspicious lesions under direct vision, are without value. With proper indications, they are of great value in diagnosis and management of many problems. On the other hand, they almost certainly are performed too frequently on too many people at too great a cost.

So are most other procedures we physicians perform on inpatients and outpatients.

At this point, I have made some very dogmatic statements and you should be asking where is the hard data to support my contentions. Unfortunately, medicine until recently had not tried to answer questions such as: How many normal "oscopies" or CAT scans or blood chemistries is it reasonable to perform before finding an abnormality that results not only in additional tests or change in diagnosis or management but in a significant difference in outcome. We are so concemed about false-negatives with all of the implications of a missed diagnosis that we overlook the enormous mischief that is produced by the false-positive results of tests and procedures.

Morris Collen MD[4] of the Kaiser Permanente Group in Oakland is one of the few physicians who has carefully kept information for the past 30 years on patients who have undergone multiple tests as a part of multiphasic testing. He found only two tests that made any difference in the outcome as measured by decreased rates in death and disability. These were blood pressure readings and proctoscopy. All of the millions of other procedures being routinely performed on apparently well people throughout the nation appear to have had little influence on improving health. In fact, just the reverse may be true in that many procedures have an adverse effect on health.[5]

How Appropriate?

Why has medicine not made greater efforts to answer basic questions like what is the appropriate use of technology? I am convinced that at least part of the answer to that question is the fear that the answers may be financially harmful to much of the entire system. This includes the manufacturers of the equipment, the marketing and sales staff, as well as the physicians, technicians and hospitals that use the equipment. It would, however, be too cynical to attribute this solely to self-serving inertia on the part of the medical care system. There are very real problems in trying to evaluate the benefits of technology.

Technology, particularly new high technology, changes fast. Often by the time a study is designed, approved, and financed, the technology has changed so much that the study will be irrelevant before it gets underway. For example, soon after a study is designed to determine the cost-effectiveness of a second generation x-ray CT or nuclear scanning unit, a third generation unit enters the arena. This unit is said to have improved hardware that permits better resolution with reduced radiation risk, faster through-time at less cost. This creates two big problems for the investigators. First, if they still want to carry out the study, they have to rewrite the proposal and secure new approval by the granting organization. Second, they contribute to the cost of medical care by convincing the hospital to purchase the newer, as yet even less verified, equipment. Even under ideal circumstances, evaluating technology is costly, frustrating, and extremely demanding of time and talent.

Some Answers

With this background of unanswered questions and additional problems, your concerns and mine should be: Is there any way that we can find the appropriate use of technology.

We have already noted that it is not the technology but its inappropriate use that is the problem. Some of the solutions that were proposed in the past are:

1. **Rationing.**—Use of high technology only for those problems where there is a reasonable probability of correcting or modifying a condition that will result in survival for a long enough period of time to justify the cost of the procedure and intervention. This is being used in England for renal dialysis and renal transplant for kidney failure as the model. The English achieved rationing by assigning a fixed budget for end-stage renal disease. If you overspend the hospital or clinic budget, no more dialysis or renal transplants will be done until next year.[6] This appears to be working rather well in England. Most of us, in our land of plenty with presumed unlimited resources, have difficulty in accepting finite medical resources and rationing, but this is changing.

2. **Peer Review.**—The peer review mechanism with both the prospective and retrospective reviews being continued and expanded. Medicine as a profession has always supported the concept of peer review—to have your performance judged by your peers rather than by outsiders. A cardiac surgeon reviews the performance of a cardiac surgeon, an oncologist of an oncologist, and so on. People who live or work in glass houses shouldn't throw stones. If their livelihood requires working in one, they seldom will. On the other hand, if a generalist is enlisted to review the appropriateness of the specialist's decisions in using high diagnostic or therapeutic technology and disagrees with the decisions made, his opinions are apt to be disregarded because of lack of expertise. In my opinion peer review, including the original PSRO or its descendants the PROS, is not the proper vehicle to resolve the use of technology issues.

3. **A Fixed Budget.**—A fixed budget for management of all health problems of a geographically defined area. This is another form of rationing, across the board rather than for a specific technology or a specific medical problem: It does permit the geographical area to define its own priorities which have merit.

4. **Education.**—Education of both physicians and patients as to realistic expectations of the use of technology along with any combinations of other efforts to prevent misuse of technology.

All of the above approaches have some merit, but for the greater part we cannot use them properly because we have never bothered to gather and analyze the information we need to make rational decisions.

Conclusion

Here we are then in 1990, in a nation over $3 trillion in debt, finally realizing that our resources are finite; that our elderly are getting older faster than they are dying off; that a nation that seems to be pinning its future existence on service industries is in deep trouble.

Fortunately, there is a solution to the proper use of technology. It neither has been formally proposed nor considered. It is a solution that does not require decisions.

The first is that any technology, new or old, having met safety requirements, must also meet requirements as to efficacy under

specific circumstances.

This in turn would necessitate answers to such questions such as: "Does the procedure significantly alter the diagnosis, treatment or outcome of the disease (with major emphasis on the outcome), and at what cost?

This would require research design and methods, data collection and analysis applicable to the technology and medical problem under study. Knowledge, skills and funds would also be needed. The funds would be generated by the technology being investigated. A certain percentage of the fee for the service, say 10%, of the charge for new high technology with poorly documented or undocumented efficacy would be set aside to investigate the technology. As done with other research projects, patients would be informed as to the details, including the reasons for the study. The hospital or clinic using the equipment could participate in the study and recover part of the costs for such research by being paid for the data obtained but the research study itself would be designed and carried out under supervision of a disinterested investigator. Similar efforts could also be applied to long-established, low-level technology such as routine blood counts and even urinalysis. This would make it possible to shift disproportionate efforts in cost control to more reasonable efforts to define the proper use of technology, with cost control as an important by-product.

In conclusion, if technology high or low is to be used appropriately, we have to stop thinking of increasing the size of the medical monetary pie with an increasing share for everybody including those involved in high technology. This will not happen because the pie is not going to get much bigger.

We must also escape the narrow thinking that is bred by increased specialization with major efforts spent in protection of turf and the kind of mentality that builds bridges over River Kwais.

Medicine is a part of our social structure. Physicians must step out of their narrow roles and assume broader roles as citizens by using their knowledge and experience to solve one of society's major problems - the appropriate use of technology in that large and increasing segment of our population that we call the elderly. We physicians can perceive ourselves as guardians of the past and protectors of special interests, or we can boldly and unselfishly move ahead and lead the way to the solution rather than continue to be part of the problem.

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